Systems Engineering Maturity and Benchmarking

SPC-95075-CMC
Version 01.00.06

August 1996

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (*Leave blank*)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	September 1996	Technical Report - Final

4. TITLE AND SUBTITLE

Systems Engineering Maturity and Benchmarking

5. FUNDING NUMBERS

G MDA972-96-1-0005

6. AUTHOR(S) M. Hanna
Produced by Software Productivity Consortium under contract to Defense Advanced Research Projects Agency

7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(ES)

Software Productivity Consortium
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2214 Rock Hill Road
Herndon, VA 20170

8. PERFORMING ORGANIZATION REPORT NUMBER

SPC-95075-CMC,
Version 01.00.00

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

DARPA/ITO
3701 N. Fairfax Dr.
Arlington, VA 22203

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

N/A

12a. DISTRIBUTION / AVAILABILITY STATEMENT

No Restrictions

12b. DISTRIBUTION CODE

1

13. ABSTRACT *(Maximum 200 words)*

This technical report provides an overview of the use and application of the included Systems Engineering Maturity and Benchmarking Questionnaire. The questionnaire is a vehicle used to assess the maturity level of the systems engineering process and to identify the tools, practices and methodologies that are in use in the organization.

This report is intended for those individuals involved with systems engineering organizational development, process definition/development, process improvement, and SE-CMM assessment. It will enable an organization to:

- Identify the state of practice of systems engineering
- Support process improvement efforts:
  - Provide a basis to develop new methodologies and processes
  - Provide a baseline to investigate alternates in systems engineering
  - Provide the means to assess the changes due to use of alternate systems engineering methodologies, tools, and processes
- Compare groups and organization against each other.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Systems Engineering, Benchmarking, SE-CMM, Process Improvement	100
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL

Systems Engineering Maturity and Benchmarking

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Produced by
SOFTWARE PRODUCTIVITY CONSORTIUM
SPC Building
2214 Rock Hill Road
Herndon, Virginia 22070

 This material is based in part upon work sponsored by the Defense Advanced Research Projects Agency under Grant #MDA972-92-J-1018. The content does not necessarily reflect the position or the policy of the U.S. Government, and no official endorsement should be inferred.

CMM[SM] and Capability Maturity Model[SM] are service marks of Carnegie Mellon University.

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1. INTRODUCTION

In industry today, there is considerable emphasis on attempting to quantify, qualify, and define systems engineering and the systems engineering process. Systems Engineering Process Assessments (SEPAs) and the like, are being performed to identify the relative maturity of the process (e.g., how well do processes match up with a macro model and how well are they institutionalized and used). While these assessments can be powerful tools, they do not provide insight into the methodology of systems engineering or the effectiveness of the systems engineering process. Only when the maturity level, methods, tools, and effectiveness are viewed in the aggregate, can the systems engineering process be truly assessed. Figure 1 shows this aggregate view of systems engineering.

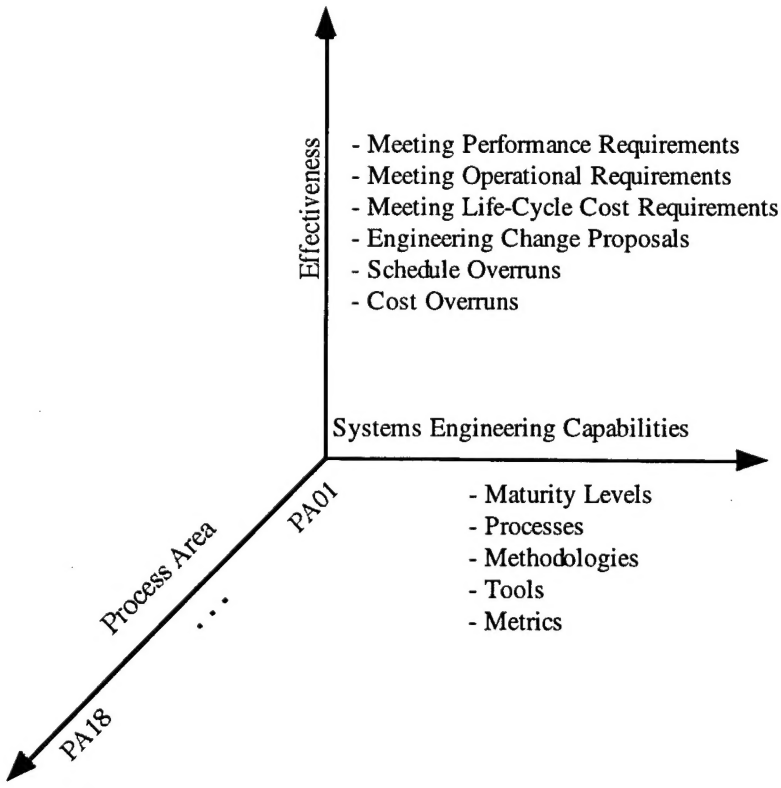

Figure 1. Overview of Systems Engineering

One method of obtaining this perspective is through benchmarking the systems engineering process. The following list describes several key benefits of performing a benchmarking effort of this type:

- Identifies the state of practice of systems engineering:
  - Determines levels of maturity of the organization
  - Demonstrates how organizations compare
  - Provides a baseline to investigate alternates in systems engineering
  - Provides the means to assess the changes due to the use of alternate systems engineering methodologies, tools, and processes
- Identifies the present systems engineering methodologies:
  - Provides a basis to develop new methodologies
  - Provides the means to measure improvement
- Identifies the predominant systems engineering tools
- Correlates practices, methodologies, and tools with process maturity level and marketplaces

Other benefits of benchmarking the systems engineering process include:

- Provides systems engineering process model exposure (e.g., for an organization preparing for a SEPA
- Identifies expertise in the process areas
- Provides a tool for process improvement
- Provides a means to compare groups and organizations against each other

1.1 SCOPE

This technical report provides a brief overview of the use and application of the Systems Engineering Maturity and Benchmarking Questionnaire. The questionnaire is a vehicle used to assess the maturity level of the systems engineering process and to identify the tools, practices, and methodologies that are used in an organization.

1.2 AUDIENCE

The intended audience for this technical report includes those individuals involved with systems engineering organizational development, process definition, process improvement, and SEPA preparation.

1.3 ORGANIZATION OF THE TECHNICAL REPORT

This report is organized in the following manner:

- Section 2 presents an overview of the objectives, basis, and structure of the questionnaire.

- Section 3 describes the various applications that the questionnaire can be used to support.
- Section 4 presents an overview of how to tailor and administer the questionnaire and how to interpret the results.
- Appendix A presents an overview of the available systems engineering process models.
- Appendix B presents the Systems Engineering Maturity and Benchmarking Questionnaire.

1.4 TYPOGRAPHIC CONVENTIONS

This report uses the following typographic conventions:

Serif font.....General presentation of information.

Italicized serif font.....Publication titles.

Boldfaced serif font.....Section headings and emphasis.

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2. QUESTIONNAIRE OVERVIEW

2.1 OBJECTIVES

The objectives of using the Systesm Engineering Maturity and Benchmarking Questionnaire are:

- To gather a broad understanding of the level of maturity of the systems engineering process in use today
- To understand the tools and methods in use
- To identify (if any) groupings (domains)
- To investigate a possible correlation between level of maturity, tools used, and methodologies

2.2 BASIS

The basis of the questionnaire is the Systems Engineering Capability Maturity Model (SE-CMM[SM]), Version 1.1, which was developed as a collaborative effort among industry, academia, and government entities. The SE-CMM is intended to support process improvement efforts through appraisal of an organization's systems engineering process. The model is based on 18 Process Areas (PAs) covering engineering, project, and organization categories. Table 1 shows the mapping between the PAs and the categories. For each PA, there are associated capability levels or maturity levels identifying how well an organization performs the practice. Table 2 shows the common features for each maturity level.

Table 1. Process Areas by Category

Engineering		
	PA 01	Analyze Candidate Solutions
	PA 02	Derive and Allocate Requirements
	PA 03	Evolve System Architecture
	PA 04	Integrate Disciplines
	PA 05	Integrate System
	PA 06	Understand Customer Needs and Expectations
	PA 07	Verify and Validate System
Project		
	PA 08	Ensure Quality
	PA 09	Mange Configurations
	PA 10	Mange Risk
	PA 11	Monitor and Control Technical Effort
	PA 12	Plan Technical Effort
Organization		
	PA 13	Define Organization's Systems Engineering Process
	PA 14	Improve Organization's Systems Engineering Processes
	PA 15	Manage Product Line Evolution
	PA 16	Manage Systems Engineering Support Environment
	PA 17	Provide Ongoing Skills and Knowledge
	PA 18	Coordinate With Suppliers

Table 2. Levels of Maturity and Common Features

Maturity Level	Capability Level	Common Features
0	Not Performed	
1	Performed Informally	• Base practices performed
2	Planned and Tracked	• Committing to perform • Planning performance • Disciplined performance • Tracking performance • Verify performance
3	Well Defined	• Defining a standard process • Tailoring the standard process • Using data • Perform the defined process
4	Quantitatively Controlled	• Establishing measurable quality goals • Determining process capability to achieve goals • Objectively managing performance
5	Continuously Improving	• Establishing quantitative process effectiveness goals • Improving process effectiveness

2.3 STRUCTURE

The questionnaire contains four sections:

1. Organizational Information. This section contains general information about the respondent and the organization. This information is used for logistical purposes only and is not typically contained in the data analysis sample.

2. Systems Engineering Overview. This section attempts to capture a general overview of the systems engineering process within an organization.

3. Key Systems Engineering Process Areas. This section gathers maturity data, tools, and methods used for each of the 18 PAs. For each PA, a common template (as shown in Table 3) is used to address several questions.

Table 3. Common Questionnaire Template

Process Adequacy	• Is the process area generally performed to a sufficient level to ensure a cost-effective system that satisfies the customer's requirements? • What are the limiting factors for the process area?
Applied Methodology	• What methods are generally performed for the process area? • What tools are generally used? • What internal, industry, and government standards are used? • What metrics are used to monitor the process?
Process Improvement	• What are the two limiting items for the process?

4. Survey Feedback Form. This section allows the respondents to provide feedback on the questionnaire for future updates.

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3. USING THE QUESTIONNAIRE

3.1 ASSESSMENT PREPARATION

As more organizations are becoming involved in the assessment of their systems engineering process, there is a growing desire for a low cost way to prepare for it. Because the Systems Engineering Maturity and Benchmarking is based on the SE-CMM, the questionnaire provides the means to acquaint the organization with the SEPA process. Analysis of the results of the questionnaire can provide insight into areas where additional training is required, identify process weaknesses and strengths of the organization, and provide an overview of the relative maturity of the organization.

3.2 BENCHMARKING

The primary objective of the questionnaire is to provide a tool to benchmark key information concerning processes, methodologies, tools, and metrics in a common framework. Depending on the needs of the survey team, the questionnaire can be used to assess the systems engineering process at various levels of abstraction as shown in Table 4.

Table 4. Information Gathered at Various Levels of Abstraction

Level of Abstraction	Information Gathered
Organizational	• Compare various groups/programs • Baseline the present system engineering process • Develop an understanding of the state of practices within the organization
Company	• Compare organizations within a company • Identify areas of process expertise • Develop an understanding of the state of practices within the company
Corporate	• Compare companies within a corporation • Identify areas of process expertise • Develop an understanding of the state of practices within the corporation
Industry	• Compare corporations and industries • Identify areas of process expertise • Develop an understanding of the state of practices of systems engineering in the industry at large

3.3 PROCESS IMPROVEMENT THROUGH BENCHMARKING

The classic definition of benchmarking is to compare something to a standard. While this definition is correct, its static nature limits benchmarking to that of a measure as opposed to a driver of change. The definition of benchmarking in the active form is:

> A continuous process of measuring products, services and practices against the toughest competitors or those . . . recognized as leaders.
>
> David T. Kearns, CEO, Xerox Corporation

In other words, benchmarking is a continuing process of:

- Identifying leading organizations (projects, companies, or industries) with complementary products, processes, and methodologies
- Comparing the current organization against these leading organizations
- Learning were similarities and differences exist among the compared organizations
- Understanding the differences among the compared organizations
- Evolving an organization's present process with what was learned
- Implementing the new process
- Refining the process to develop organizational best practices

4. SURVEY

4.1 TAILORING/ADMINISTRATION/DATA REDUCTION

The questionnaire was developed to be tailorable and easily administered by a survey team. Figure 2 demonstrates the overall tailoring/administration/data reduction effort.

The survey process can be seen as a two step process. The first is to survey a small group of respondents with an exploratory questionnaire. This allows the survey team to identify groupings or domains in the response. These groupings are used to replace the exploratory (textual) responses with quantifiable selections (i.e., check a box). The updated questionnaire is then given out to a broad group, and the results are reduced using standard tools and techniques.

4.1.1 TAILORING

As shown in Figure 2, there are four primary areas (T1 through T4) to tailor the questionnaire. They are:

T1 Replacing the general terminology and references to project/organization/company with specific ones
This tailoring step can provide significant benefit in the survey process by reducing the need for clarification by the survey team and reducing the uncertainty on the part of the respondent. The net result is a questionnaire that is quicker to fill out and easier to understand and produces higher quality results by reducing confusion.

T2 Down selecting PAs based on organizational goals
Depending on the organization and the survey goals, only a subset of process areas may be addressed. This down selection can be based on the fact that certain organizations may perform only select PAs, or the organization may want to concentrate in select PAs.

T3 Replacing exploratory (textual) responses with quantifiable selections
There is an initial requirement to use a textual based questionnaire to identify groupings or domains of tools, methods, and metrics. Once these have been identified, the textual response can be replaced by a delineated list of "common" elements. The questionnaire may be directly updated, or a "tickle list" may be provided separately. It is important to note that due to the rapid changes in the marketplace these "common" elements age rapidly.

T4 Down selecting process areas based on the results of the initial survey
The results of the initial survey can be very informative in identifying PAs that are not performed or revealing inconsistencies (no groupings or domains) among the respondents. Alternatively, the initial results may find a very high level of consistency. In this case, the survey team may decide to down select the PAs to benchmark.

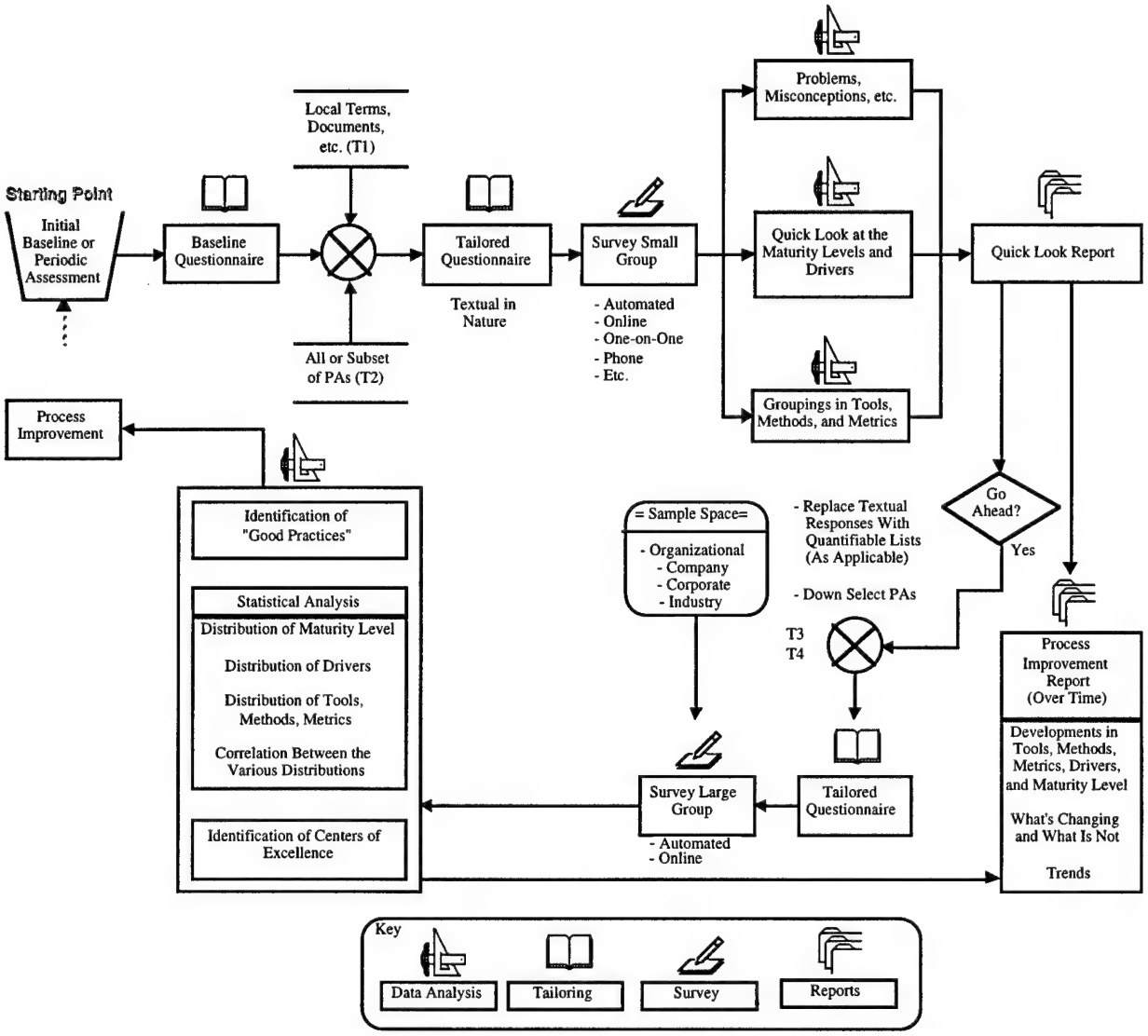

Figure 2. Tailoring/Administration/Data Reduction

4.1.2 ADMINISTRATION

Depending on the number of planned respondents, physical location, survey phase, tools available, and the organizational goals, the questionnaire can be administered in several different forms. The following survey administration methods may be used:

Hard copy — Photocopies of the questionnaire. Hard copy is the simplest method to administer (hand or mail out, no special tools are required) and the most

difficult to fill out and perform data reduction on. The use of hard copy should be limited as much as possible.

Online — Interactive questionnaire available via local area networks and wide area networks (e.g., Internet). Assuming the respondent has access, online is the simplest method for both the respondent and the survey team. Collected data is automatically placed into a centralized data repository for data reduction and analysis.

One-on-one — One-on-one between a survey team member and the respondent. One-on-one is the most time consuming method available, but it gives the highest quality results. This method is very useful during the initial survey to not only identify groupings and domains, but to understand where there is a shortcoming in the questionnaire. During the broad survey, one-on-one may be used as a follow-up method to gather detailed information in the support of process improvement and the identification of centers of excellence.

Phone — Similar to the one-on-one, but done over the phone. Although not as effective as the one-on-one method, phone surveys provide good results at lower cost by eliminating the need for travel.

Soft copy — Copy of the questionnaire on diskette. Similar to the online method, but electronic copies of the questionnaire are handed or mailed out to the respondents. The main drawback with this method is the time delay involved with mailing to a location, mailing it back, and then uploading the data into a central repository for data reduction and analysis. While not as automated as the online method, it eliminates the need for network access, development of an online questionnaire, and concerns of data access on a nonsecured network.

4.1.3 Data Reduction

During the initial small group survey, much of the data collected is in the form of textual responses. While textual responses contain a high level of information, they do not lend themselves to traditional data analysis techniques. The survey team needs to interpret the textual responses in an attempt to identify groupings or domains. Depending on the expertise of the survey team, discipline experts may be called on to support this interpretation. When the groupings or domains are identified, they need to be fed back to the respondents to verify that the groupings or domains adequately capture the intent.

During the broad survey, the amount of textual responses should be minimal to allow for more traditional data reduction and analysis techniques. Some typical analyses that would be performed include:

- Distribution of maturity levels
- Distribution of drivers

- Distribution of tools, methods, and metrics
- Correlation between the various distributions
- Identification of centers of excellence

Additional analyses may be performed to compare previous survey results with the present results. The objective of this data analysis is to support the process improvement effort by identifying developments in tools, methods, metrics, drivers, and maturity level and associated trends.

4.2 SECURITY

For most organizations, the questionnaire data needs to be maintained in an anonymous fashion. This level of confidentiality provides a protective blanket for the respondent to alleviate any apprehension in recording "what really goes on" verses "what is politically correct." It is up to the survey team to foster this open and frank environment with the respondents. The survey team can create an open atmosphere by being up front with the respondents concerning the objective of the survey and what will happen. The team can also assure respondents that:

- No project or individual will be identified in the findings.
- No discussion of the comments will occur outside the survey.
- All raw data will be destroyed after the survey is performed (typically).

In some cases, a member of the survey team will have a "key" that maps respondents to the individuals. This key is used when specific data needs to be gathered. For example, when locating process expertise, the survey team would want to go back to the process expert to document and better understand the process.

APPENDIX A. SYSTEMS ENGINEERING PROCESS MODELS

A.1 PROCESS MODEL DESCRIPTIONS

At present, there are two common systems engineering process models: SEI's SE-CMM and INCOSE's Systems Engineering Cabability Assessment Model (SECAM). The basic structure of SE-CMM and the SECAM are similar, with each assessing the systems engineering process through a series of PAs (SE-CMM) or Key Focus Areas (KFAs) (SECAM). Tables 5 and 6 provide a mapping between PAs and KFAs.

Table 5. Mapping of SE-CMM Process Areas and SECAM Key Focus Areas

SE-CMM (V1.1) Process Areas		SECAM (V1.0) Key Focus Areas	
PA 01	Analyze Candidate Solutions	KFA 3.4	Integrated Engineering Analysis
PA 02	Derive and Allocate Requirements	KFA 3.2	System Requirements
PA 03	Evolve System Architecture	KFA 3.3	System Design
PA 04	Integrate Disciplines	KFA 1.4	Intergroup Coordination
PA 05	Integrate System	KFA 3.5	System Integration
PA 06	Understand Customer Needs and Expectations	KFA 3.1	System Concept Definition
PA 07	Verify and Validate System	KFA 3.6 KFA 3.7	System Verification System Validation
PA 08	Ensure Quality	KFA 1.6	Quality Assurance
PA 09	Manage Configurations	KFA 1.5	Configuration Management
PA 10	Manage Risk	KFA 1.7	Risk Management
PA 11	Monitor and Control Technical Effort	KFA 1.2	Tracking and Oversight
PA 12	Plan Technical Effort	KFA 1.1	Planning
PA 13	Define Organization's Systems Engineering Process	KFA 2.1	Process Management and Improvement
PA 14	Improve Organization's Systems Engineering Processes		
PA 15	Manage Product Line Evolution	KFA 2.3	Technology Management
PA 16	Manage Systems Engineering Support Environment	KFA 2.4	Environment and Tool Support
PA 17	Provide Ongoing Skills and Knowledge	KFA 2.2	Training
PA 18	Coordinate With Suppliers	KFA 1.3	Subcontract Management

Table 6. Mapping of SECAM Key Focus Areas and SE-CMM Process Areas

SECAM (V1.0) Key Focus Areas		SE-CMM (V1.1) Process Areas	
KFA 1.1	Planning	PA 12	Plan Technical Effort
KFA 1.2	Tracking and Oversight	PA 11	Monitor and Control Technical Effort
KFA 1.3	Subcontract Management	PA 18	Coordinate With Suppliers
KFA 1.4	Intergroup Coordination	PA 04	Integrate Disciplines
KFA 1.5	Configuration Management	PA 09	Manage Configurations
KFA 1.6	Quality Assurance	PA 08	Ensure Quality
KFA 1.7	Risk Management	PA 10	Manage Risk
KFA 2.1	Process Management and Improvement	PA 13	Define Organization's Systems Engineering Process
		PA 14	Improve Organization's Systems Engineering Processes
KFA 2.2	Training	PA 17	Provide Ongoing Skills and Knowledge
KFA 2.3	Technology Management	PA 15	Manage Product Line Evolution
KFA 2.4	Environment and Tool Support	PA 16	Manage Systems Engineering Support Environment
KFA 3.1	System Concept Definition	PA 06	Understand Customer Needs and Expectations
KFA 3.2	System Requirements	PA 02	Derive and Allocate Requirements
KFA 3.3	System Design	PA 03	Evolve System Architecture
KFA 3.4	Integrated Engineering Analysis	PA 01	Analyze Candidate Solutions
KFA 3.5	System Integration	PA 05	Integrate System
KFA 3.6	System Verification	PA 07	Verify and Validate System
KFA 3.7	System Validation	PA 07	Verify and Validate System

A.2 ORDERING INFORMATION

The SE-CMM (Systems Engineering Capability Maturity Model, V1.1, CMU/SEI-95-MM-003) is available from the following sources:

Software Productivity Consortium
SPC Building
2214 Rock Hill Road
Herndon, Virginia 22070

1-800-827-4SPC

Electronic copy is also available online. Please contact the Consortium for more information.

Software Engineering Institute
Carnegie Mellon University
Pittsburgh, Pennsylvania 15213

412-268-2000

Electronic copy is also available online. Please contact SEI for more information.

Defense Technical Information Center (DTIC)
Attn: DTIC-OCP
8725 John J. Kingman Road
Suite 0944
Ft. Belvoir, Virginia 22060-6218

703-767-8019/8021/8022/8023

National Technical Information Service (NTIS)
U.S. Department of Commerce
Springfield, Virginia 22161

703-487-4600

Research Access, Inc.
800 Vinial Street
Pittsburgh, Pennsylvania 15212

1-800-685-6510

The SECAM (Systems Engineering Capability Assessment Model) is available from the following source:

International Council on Systems Engineering (INCOSE)
2033 Sixth Avenue, Suite 804
Seattle, Washington 98121

206-441-1164 or 800-366-1164

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LIST OF ABBREVIATIONS AND ACRONYMS

INCOSE	International Council on Systems Engineering
KFA	Key Focus Area
PA	Process Area
SECAM	System Engineering Capability Assessment Model
SE-CMM	Systems Engineering Capability Maturity Model
SEI	Software Engineering Institute
SEPA	Systems Engineering Process Assessment

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APPENDIX B. SYSTEMS ENGINEERING MATURITY AND BENCHMARKING QUESTIONNAIRE

Produced by the
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1. Introduction to the Questionnaire

Objective

The objective this Questionnaire is threefold: First, is to gather a broad understanding of the level of maturity of the systems engineering process in use in industry today. Second, is to understand the tools and methods used by these sampled organizations and identify (if any) groupings (domains). Third, investigate possible correlation between level of maturity, tools used, and methodologies.

Questionnaire Foundation

The basis of the Questionnaire is the Systems Engineering Capability Maturity Model (SE-CMM), Version 1.1, which was developed as collaborative effort among industry, academia and government entities. The SE-CMM is intended to assess the maturity of an organization's systems engineering process. This assessment is based upon 18 Process Areas (PAs) that cover engineering, project and organization categories. They are (in alphabetical order):

PA 01: Analyze Candidate Solutions
PA 02: Derive and Allocate Requirements
PA 03: Evolve System Architecture
PA 04: Integrate Disciplines
PA 05: Integrate System
PA 06: Understand Customer Needs and Expectations
PA 07: Verify and Validate System
PA 08: Ensure Quality
PA 09: Mange Configurations
PA 10: Mange Risk
PA 11: Monitor and Control Technical Effort
PA 12: Plan Technical Effort
PA 13: Define Organization's Systems Engineering Process
PA 14: Improve Organization's Systems Engineering Processes
PA 15: Manage Product Line Evolution
PA 16: Manage Systems Engineering Support Environment
PA 17: Provide Ongoing Skills and Knowledge
PA 18: Coordinate With Suppliers

For each process area, there is an associated capability level or maturity level identifying how well an organization performs the practice. Table 1-1 shows the levels of maturity.

Table 1-1. Levels of Maturity

Maturity Level	Capability Level	Common Features
0	Not Performed	
1	Performed Informally	• Base practices performed
2	Planned and Tracked	• Committing to perform • Planning performance • Disciplined performance • Tracking performance • Verify performance
3	Well Defined	• Defining a standard process • Tailoring the standard process • Using data • Perform the defined process
4	Quantitatively Controlled	• Establishing measurable quality goals • Determining process capability to achieve goals • Objectively managing performance
5	Continuously Improving	• Establishing quantitative process effectiveness goals • Improving process effectiveness

The Questionnaire is structured around the 18 process areas. For each process area, a common template has been develop to address the following questions

Process Adequacy:	• Is the process area generally performed to a sufficient level to ensure a cost effective system which satisfies the customers requirements • What are the limiting factors for the process area
Applied Methodology:	• What methods are generally performed for the process area • What tools are generally used • What internal, industry and government standards are used • What metrics are used to monitor the process
Process Improvement:	• What are the two limiting items for the process

Questionnaire Structure

The Questionnaire is made up of four sections:

1. 2. Organizational information
   General information about the respondent and the organization. This information is used for logistical purposes only and is not contained in the data analysis sample.
2. 3. Systems engineering overview
   This section attempts to capture a general overview of the systems engineering process within an organization.
3. 4. Key systems engineering process areas
   This section gathers maturity data, tools and methods used for each of the 18 process areas.
4. 5. Survey feedback form
   This section allows for the participant to provided feedback on the Questionnaire to the writers for future updates.

Estimated Time to Complete

4 - 9 Hours (15-30 minutes/area @ 18 process areas & systems engineering overview)

Confidentiality

The information contained in this Questionnaire is maintained in the highest confidence and access permitted to only Software Productivity Consortium's data reduction team members. Usage and publication of the findings will be in non-attributable aggregate forms only.

Frequently Asked Questions

Q What is a process area?

A The SE-CMM defines a process area as a "purpose and a set of related systems engineering process characteristics, when performed collectively, can achieve the defined purpose."

Q If I don't do a particular process area, what should I do?

A If you do not perform the process area, find an appropriate individual(s) who can address the process area and have them fill it out. The Questionnaire covers a wide of range of activities that my be performed my different individuals. It is perfectly expectable to have several individuals filling out the various process areas. In such a case, each individual should fill-out a copy of the Survey Feedback form located in the back of the Questionnaire.

If your organization does not perform the process area, you don't have to fill out that particular section. After the description of the process area, you will be asked if your organization performs this process area, indicate a *NO*, and skip to the next process area.

Q Has the Questionnaire been verified and validated?

A Yes. The Questionnaire is based upon the industry available SE-CMM and developed by some of the members of the authoring team. Verification was done by an internal questionnaire experts and validation by an independent group of practicing systems engineers.

Q Do I need to know the SE-CMM or have a copy of it to fill out this Questionnaire?

A No additional documents should be required to explain this Questionnaire.

Q Can you define some of your terms?

A The following definitions are from the SE-CMM:

Method:	A reasonably complete set of rules and criteria that establish a practice and repeatable way of performing a task to provide a desired result.
Methodology:	A collection of methods, procedures, and standards that defines an integrated synthesis of engineering approaches to the development of a product
Metric:	A composite of two or more measurements resulting is a value that defines a characteristic of the process
Organization:	A unit within an entity (e.g., company, government agency, or branch of service) within which many projects are managed as a whole. All projects within an organization, at the top of the reporting structure, share a common manager and common policies.
System:	An integrated composite of people, products, and processes that provide a capability to satisfy a stated need or objective.
Systems Engineering:	The selective application of scientific and engineering efforts to: 1) transform an operational need into a description of a system configuration which best satisfies the operational need according to the measures of effectiveness; 2) integrate related technical parameters and ensure compatibility of all physical, functional, and technical program interfaces in a manner which optimizes the total system definition and design; 3) integrate the efforts of all engineering disciplines and specialties into the total engineering effort.

Q Where can I get a copy of the SE-CMM?

A The SE-CMM (Systems Engineering Capability Maturity Model, V1.1 CMU/SEI-95-MM-003) is available from several sources:

Software Productivity Consortium
SPC Building
2214 Rock Hill Road
Herndon, Virginia 22070

1-800-827-4SPC

Electronic copy is also available on-line. Please contact SPC for more information.

Software Engineering Institute
Carnegie Mellon University
Pittsburgh, Pennsylvania 15213

412-268-2000

Electronic copy is also available on-line. Please contact SEI for more information.

Defense Technical Information Center (DTIC)
Attn: DTIC-OCP
8725 John J. Kingman Road
Suite 0944
Ft. Belvoir, VA 22060-6218

703-767-8019/8021/8022/8023

National Technical Information Service (NTIS)
U.S. Department of Commerce
Springfield, VA 22161

703-487-4600

Research Access, Inc.
800 Vinial Street
Pittsburgh Pennsylvania 15212

1-800-685-6510

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2. Organizational Information

Respondent Information

Name: _____ Date: _____

Title: _____

Phone _____

Fax _____

Project: _____

Organizational Information

Company _____

Division _____

Address _____

_____

_____

_____

_____

_____

1. Who are your organization's customers? [Check all that apply]
   a. [ ] Department of Defense
   b. [ ] Civilian Federal Government
   c. [ ] State Government
   d. [ ] Local Government
   e. [ ] Commercial
   f. [ ] Industrial

2. Which best describes the activities in which your organization is involved? [Check all that apply]

a. [ ]	Light manufacturing	h. [ ]	Automotive
b. [ ]	Heavy manufacturing	i. [ ]	Aircraft
c. [ ]	Software development	j. [ ]	Communication
d. [ ]	Hardware development	k. [ ]	Mining
e. [ ]	System development	l. [ ]	Shipping
f. [ ]	Engineering consulting	m. [ ]	Building
g. [ ]	Other: _____	n. [ ]	Commercial

3. What is the value of sales at your organization? [Check one]
   a. [ ] > $1B
   b. [ ] $750M - $1B
   c. [ ] $500M - $750M
   d. [ ] $250M - $500M
   e. [ ] $100M - $250M
   f. [ ] $50M - $100M
   g. [ ] < $50M

4. Approximately, how many employees are there at your organization's site? _____

continued on next page

5. Based on content of work, what percentage of your organization's work is related to:

   a. Hardware _____ d. Data _____

   b. Software _____ e. Facilities _____

   c. Other _____ _____

6. Based on your organization's annual expenditures, what percentage of your organization's operations are:

   a. New system development _____

   b. Modifications/upgrades to existing system _____

   c. Maintenance of existing systems _____

   d. Other _____ _____

end of 2. Organizational Information

3. Systems Engineering Overview

1. Process Maturity

a. In your opinion, how consistently is the systems engineering process performed across your organization?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Systems engineering process consistently performed
(if Never performed, go to the next process area)

---

2. Process Adequacy

a. In your opinion, does your organization generally perform systems engineering to a sufficient level to ensure a cost effective system which satisfies your customers requirements?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Systems engineering sufficiently performed

b. To what extent do the following factors limit the effectiveness of the process?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Impact	
1.	[ ]	Budget limitations
2.	[ ]	Schedules limitations
3.	[ ]	Policies/procedures
4.	[ ]	Methodologies/practices
5.	[ ]	Tool availability
6.	[ ]	Tool adequacy
7.	[ ]	Systems engineering personnel availability
8.	[ ]	Engineering personnel availability
9.	[ ]	Training and personnel experience
10.	[ ]	Other _____

---

3. Applied Methodology

a. What methods are generally use in your systems engineering effort?
(Please describe and if required, please use additional paper and attach to the end of this questionnaire)

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continued on next page

b. What tools do you generally use in your systems engineering effort?

c. What internal, industry and government standards do you follow?

d. What metrics does your organization generally apply to monitor this process?

e. Do you think metrics need to be developed for this process? [Check one]

[ ] Yes - Formal metrics to assess an organization's performance for both internal use and as source selection criteria
[ ] Yes - Informal metrics to assess an organization's performance for internal use only
[ ] No
[ ] Don't know

4. Process Improvement

What do you feel are the top two items which would improve the systems engineering process in your organization?

continued on next page

5. Systems engineering practice

a. Does your organization have an accepted and documented definition of systems engineering?

[ ] Yes
[ ] No *(if not, go to question c)*
[ ] Don't know

b. Briefly, what is your organization's accepted and documented definition of systems engineering?

c. Is there a separate group chartered to do systems engineering within your organization?

[ ] Yes
[ ] No
[ ] Don't know

d. Which of the following performs most of the systems engineering in your organization? [Check one]

1. [ ] Multi-disciplined product teams
2. [ ] Multi-disciplined systems engineering teams
3. [ ] Systems engineers who are identified by that job title
4. [ ] Hardware engineers
5. [ ] Software engineers
6. [ ] Project engineers
7. [ ] Project managers
8. [ ] Customer
9. [ ] Other
10. [ ] Don't know/Not sure

end of 3. Systems Engineering Overview

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4. Key Systems Engineering Process Areas

Overview

The following section of the Questionnaire contains the 18 process areas (in alphabetical order) of systems engineering as described in the Systems Engineering Capability Maturity Model (SE-CMM). Included in the title of each process area is the corresponding Key Focus Area (KFA) as described in the Systems Engineering Capability Assessment Model (SECAM)*.

Each process area begins with a summary description and a list of base practices questions. These questions are used to address the relative maturity of the organization in the process area. Following the base practices, is a series of questions that 1) address how effective you feel your process is; 2) what methodologies, tools, standards and metrics are used by your organization in this process area, and 3) how your processes can be improved.

Instructions:

Step	Action
1.	Read the process area summary
2.	Identify how consistently you perform this process area
3.	If you don't perform this process area, skip to the next process area
4.	Identify the base practices that are performed on your project using the scale: (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)
5.	If you had only N's (Never), S's (Seldom) and D's (Don't know), skip to the next process area
6.	Answer all the questions that follow (parts 2, 3 and 4). If you need additional space, please use the back of the Questionnaire of the appropriate process area

* The SECAM is described in "Systems Engineering Capability Assessment Model - Interim Model Questionnaire, Version 1.40"; CAWG-1995-05-1.40 and is available from:

International Council on Systems Engineering (INCOSE)
2033 Sixth Avenue, Suite 804
Seattle, WA 98121

206-441-1164 or 800-366-1164

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PA 01: Analyze Candidate Solutions
(KFA: 3.4 Integrated Engineering Analysis)

Process Area Summary

The purpose of Analyze Candidate Solutions is to perform studies and analyses that will result in the selection of a solution to meet the identified problem and its defined constraints. Analyze Candidate Solutions involves defining the approach and evaluation criteria for the analysis, as well as for choosing, selecting, and studying the candidate solutions. It also involves communicating the rationale and results of the analysis.

1. Process Maturity

a. In your opinion, how consistently is this process area performed on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] This process area is consistently performed
(if Never performed, go to the next process area)

b. How consistently do you perform the following base practices on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Consistency	
1.	[ ]	Establish evaluation criteria based on the identified problem and its defined constraints.
2.	[ ]	Define the general approach for the analysis, based on the established evaluation criteria.
3.	[ ]	Identify alternatives for evaluation in addition to those provided with the problem statement.
4.	[ ]	Analyze the competing candidate solutions against the established evaluation criteria.
5.	[ ]	Select the solution that satisfies the established evaluation criteria.
6.	[ ]	Capture the disposition of each alternative under consideration and the rationale for the disposition.

2. Process Adequacy

a. Does your project generally Analyze Candidate Solutions to a sufficient level to ensure a cost effective system which satisfies your customers requirements? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Analyze Candidate Solutions sufficiently performed

b. To what extent do the following factors limit the effectiveness of the process? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Impact	
1.	[ ]	Budget limitations
2.	[ ]	Schedules limitations
3.	[ ]	Policies/procedures
4.	[ ]	Methodologies/practices
5.	[ ]	Tool availability
6.	[ ]	Tool adequacy
7.	[ ]	Systems engineering personnel availability
8.	[ ]	Engineering personnel availability
9.	[ ]	Training and personnel experience
10.	[ ]	Other _____

continued on next page

PA 01: Analyze Candidate Solutions, Continued

3. Applied Methodology

a. What methods do you generally use to Analyze Candidate Solutions? (Please describe and if required, please use additional paper and attach to the end of this questionnaire)

b. What tools do you generally use to Analyze Candidate Solutions?

c. What internal, industry and government standards do you follow?

d. What metrics does your organization generally apply to monitor this process?

e. Do you think metrics need to be developed for this process? [Check one]

- [ ] Yes - Formal metrics to assess an organization's performance for both internal use and as source selection criteria
- [ ] Yes - Informal metrics to assess an organization's performance for internal use only
- [ ] No
- [ ] Don't know

4. Process Improvement

What do you feel are the top two items which would improve the Analyze Candidate Solutions practice in your organization?

end of PA 01: Analyze Candidate Solutions

PA 02: Derive and Allocate Requirements
(KFA: 3.2 System Requirements)

Process Area Summary

The purpose of Derive and Allocate Requirements is to analyze the system and other requirements and derive a more detailed and precise set of requirements. These derived requirements are allocated to system functions', objects', people', and supporting processes, products, and services, which can be used to synthesize solutions. This process area addresses both the analysis of system-level requirements and the allocation of system-level or derived requirements to lower level functions or objects. This involves addressing the concept of operations, functional partitioning, object identification, and performance allocation, as well as capturing the status and traceability of requirements. The derived and allocated requirements will evolve as the systems requirements evolve over time. When corrective actions have an impact on requirements, it may be necessary to revise the derived and allocated requirements.

1. Process Maturity

a. In your opinion, how consistently is this process area performed on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] This process area is consistently performed
(if Never performed, go to the next process area)

b. How consistently do you perform the following base practices on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

Consistency	
1. [ ]	Develop a detailed operational concept of the interaction of the system, the user, and the environment, that satisfies the operational need.
2. [ ]	Identify key requirements that have a strong influence on cost, schedule, functionality, risk, or performance.
3. [ ]	Partition requirements into groups based on established criteria (such as similar functionality, performance, or coupling) to facilitate and focus the requirements analysis.
4. [ ]	Derive, from the system and other (e.g., environmental) requirements, requirements that may be logically inferred and implied as essential to system effectiveness.
5. [ ]	Identify the requirements associated with external interfaces to the system and interfaces between functional partitions or objects.
6. [ ]	Allocate requirements to functional partitions, objects, people, or support elements to support synthesis of solutions.
7. [ ]	Analyze requirements to ensure that they are verifiable by the methods available to the development effort.
8. [ ]	Maintain requirements traceability to ensure that lower level (derived) requirements are necessary and sufficient to meet the objectives of higher level requirements.
9. [ ]	Capture system and other requirements, derived requirements, derivation rationale, allocations, traceability, and requirements status.

continued on next page

PA 02: Derive and Allocate Requirements, Continued

2. Process Adequacy

a. Does your project generally Derive and Allocate Requirements to a sufficient level to ensure a cost effective system which satisfies your customers requirements? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Derive and Allocate Requirements sufficiently performed

b. To what extent do the following factors limit the effectiveness of the process? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Impact	
1.	[ ]	Budget limitations
2.	[ ]	Schedules limitations
3.	[ ]	Policies/procedures
4.	[ ]	Methodologies/practices
5.	[ ]	Tool availability
6.	[ ]	Tool adequacy
7.	[ ]	Systems engineering personnel availability
8.	[ ]	Engineering personnel availability
9.	[ ]	Training and personnel experience
10.	[ ]	Other _____

3. Applied Methodology

a. What methods do you generally use to Derive and Allocate Requirements? (Please describe and if required, please use additional paper and attach to the end of this questionnaire)

b. What tools do you generally use to Derive and Allocate Requirements?

c. What internal, industry and government standards do you follow?

continued on next page

PA 02: Derive and Allocate Requirements, Continued

d. What metrics does your organization generally apply to monitor this process?

e. Do you think metrics need to be developed for this process? [Check one]

[ ] Yes - Formal metrics to assess an organization's performance for both internal use and as source selection criteria

[ ] Yes - Informal metrics to assess an organization's performance for internal use only

[ ] No

[ ] Don't know

4. Process Improvement

What do you feel are the top two items which would improve the Derive and Allocate Requirements practice in your organization?

end of PA 02: Derive and Allocate Requirements

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PA 03: Evolve System Architecture
(KFA: 3.3 System Design)

Process Area Summary

The purpose of Evolve System Architecture is to provide a basis for establishing and evolving a system design. It involves deriving the architecture requirements, identifying key design issues, determining the functional and physical structure and interfaces, and allocating the architecture requirements to system elements. The practices described herein are expected to be performed iteratively with other systems engineering practices until the architecture is handed off to the implementing or component engineering disciplines.

System architecture comprises functional (or logical), physical (tangible), and foundation architectures. Evolve System Architecture activities are applicable to all life-cycle phases of a product and may be initiated either by new development, changes in requirements, or corrective actions.

1. Process Maturity

a. In your opinion, how consistently is this process area performed on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] This process area is consistently performed
(if Never performed, go to the next process area)

b. How consistently do you perform the following base practices on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Consistency	
1.	[ ]	Derive the requirements for the system architecture.
2.	[ ]	Identify the key design issues that must be resolved to support successful development of the system.
3.	[ ]	Generate alternative(s) and constraints for the architecture and select a solution in accordance with the Analyze Candidate Solutions process area (PA 01).
4.	[ ]	Develop the interface requirements for the selected architecture components.
5.	[ ]	Allocate the system and derived requirements to the chosen architecture components and interfaces.
6.	[ ]	Maintain requirement traceability for the architecture's requirements to ensure that lower level (derived) requirements are necessary and sufficient to meet the needs of higher level requirements or design.
7.	[ ]	Describe the system architecture by capturing the design results and rationale.
8.	[ ]	Identify appropriate derived requirements that address the effectiveness and cost of life-cycle phases following development, such as production and operation.

continued on next page

PA 03: Evolve System Architecture, Continued

2. Process Adequacy

a. Does your project generally Evolve System Architecture to a sufficient level to ensure a cost effective system which satisfies your customers requirements? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Evolve System Architecture sufficiently performed

b. To what extent do the following factors limit the effectiveness of the process? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Impact	
1.	[ ]	Budget limitations
2.	[ ]	Schedules limitations
3.	[ ]	Policies/procedures
4.	[ ]	Methodologies/practices
5.	[ ]	Tool availability
6.	[ ]	Tool adequacy
7.	[ ]	Systems engineering personnel availability
8.	[ ]	Engineering personnel availability
9.	[ ]	Training and personnel experience
10.	[ ]	Other _____

3. Applied Methodology

a. What methods do you generally use to Evolve the System Architecture? (Please describe and if required, please use additional paper and attach to the end of this questionnaire)

b. What tools do you generally use to Evolve the System Architecture?

continued on next page

PA 03: Evolve System Architecture, Continued

c. What internal, industry and government standards do you follow?

d. What metrics does your organization generally apply to monitor this process?

e. Do you think metrics need to be developed for this process? [Check one]

[ ] Yes - Formal metrics to assess an organization's performance for both internal use and as source selection criteria

[ ] Yes - Informal metrics to assess an organization's performance for internal use only

[ ] No

[ ] Don't know

4. Process Improvement What do you feel are the top two items which would improve the Evolve System Architecture practice in your organization?

end of PA 03: Evolve System Architecture

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PA 04: Integrate Disciplines
(KFA: 1.4 Intergroup Coordination)

Process Area Summary

The purpose of Integrate Disciplines is to identify those disciplines necessary for effective system development and create an environment in which they jointly and effectively work together toward a common agenda. Each discipline's unique expertise and concerns are brought forward and considered, but the focus on total system development is maintained. These disciplines may include, but are not limited to, problem domain, marketing, manufacturing, component design, development, reliability, maintainability, operations, quality, supportability, human factors, logistics, safety, and security. It is critical to be able to meld such disciplines without sacrificing their parochial interests concerning issues important to and unique to each discipline. This cooperative environment must persist throughout the system life cycle.

1. Process Maturity

a. In your opinion, how consistently is this process area performed on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] This process area is consistently performed
(if Never performed, go to the next process area)

b. How consistently do you perform the following base practices on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

Consistency	
1. [ ]	Involve the disciplines that are essential to system development in a timely manner.
2. [ ]	Promote cross-discipline understanding among the developers.
3. [ ]	Establish methods for interdisciplinary coordination.
4. [ ]	Establish and use methods for identifying and resolving interdisciplinary issues, and creating integrated solutions.
5. [ ]	Communicate results of interdisciplinary activities to affected groups.
6. [ ]	Develop project goals and ensure that all affected groups and individuals are fully aware of them.

continued on next page

PA 04: Integrate Disciplines, Continued

2. Process Adequacy

a. Does your project generally Integrate Disciplines to a sufficient level to ensure a cost effective system which satisfies your customers requirements?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Integrate Disciplines sufficiently performed

b. To what extent do the following factors limit the effectiveness of the process?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Impact	
1.	[ ]	Budget limitations
2.	[ ]	Schedules limitations
3.	[ ]	Policies/procedures
4.	[ ]	Methodologies/practices
5.	[ ]	Tool availability
6.	[ ]	Tool adequacy
7.	[ ]	Systems engineering personnel availability
8.	[ ]	Engineering personnel availability
9.	[ ]	Training and personnel experience
10.	[ ]	Other _____

3. Applied Methodology

a. What methods do you generally use to Integrate Disciplines?
(Please describe and if required, please use additional paper and attach to the end of this questionnaire)

b. What tools do you generally use to Integrate Disciplines?

continued on next page

PA 04: Integrate Disciplines, Continued

c. What internal, industry and government standards do you follow?

d. What metrics does your organization generally apply to monitor this process?

e. Do you think metrics need to be developed for this process? [Check one]

[ ] Yes - Formal metrics to assess an organization's performance for both internal use and as source selection criteria

[ ] Yes - Informal metrics to assess an organization's performance for internal use only

[ ] No

[ ] Don't know

4. Process Improvement

What do you feel are the top two items which would improve the Integrate Disciplines practice in your organization?

end of PA 04: Integrate Disciplines

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PA 05: Integrate System
(KFA: 3.5 System Integration)

Process Area Summary

The purpose of Integrate System is to ensure that system elements will function as a whole. This primarily involves identifying, defining, and controlling interfaces, as well as verifying system functions that require multiple system elements. The activities associated with Integrate System occur throughout the entire product life cycle.

1. Process Maturity

a. In your opinion, how consistently is this process area performed on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] This process area is consistently performed
(if Never performed, go to the next process area)

b. How consistently do you perform the following base practices on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

Consistency	
1. [ ]	Develop detailed specifications of the interfaces implied by the system architecture.
2. [ ]	Coordinate interface specifications and changes with all affected groups and individuals.
3. [ ]	Verify the receipt of each system element required to assemble the system in accordance with the physical architecture.
4. [ ]	Verify the implemented design features of developed or purchased system elements against their requirements.
5. [ ]	Verify that the system element interfaces comply with the interface specifications prior to assembly.
6. [ ]	Assemble aggregates of system elements in accordance with the established integration strategy.
7. [ ]	Check the integrated system interfaces in accordance with the established integration strategy.
8. [ ]	Develop an integration strategy and supporting documentation that identify the optimal sequence for receipt, assembly, and activation of the various components that make up the system.

continued on next page

PA 05: Integrate System, Continued

2. Process Adequacy

a. Does your project generally Integrate System to a sufficient level to ensure a cost effective system which satisfies your customers requirements?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Integrate System sufficiently performed

b. To what extent do the following factors limit the effectiveness of the process?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Impact	
1.	[ ]	Budget limitations
2.	[ ]	Schedules limitations
3.	[ ]	Policies/procedures
4.	[ ]	Methodologies/practices
5.	[ ]	Tool availability
6.	[ ]	Tool adequacy
7.	[ ]	Systems engineering personnel availability
8.	[ ]	Engineering personnel availability
9.	[ ]	Training and personnel experience
10.	[ ]	Other _____

3. Applied Methodology

a. What methods do you generally use to Integrate System?
(Please describe and if required, please use additional paper and attach to the end of this questionnaire)

b. What tools do you generally use to Integrate System?

continued on next page

PA 05: Integrate System, Continued

c. What internal, industry and government standards do you follow?

d. What metrics does your organization generally apply to monitor this process?

e. Do you think metrics need to be developed for this process? [Check one]

[ ] Yes - Formal metrics to assess an organization's performance for both internal use and as source selection criteria

[ ] Yes - Informal metrics to assess an organization's performance for internal use only

[ ] No

[ ] Don't know

4. Process Improvement

What do you feel are the top two items which would improve the Integrate System practice in your organization?

end of PA 05: Integrate System

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PA 06: Understand Customer Needs and Expectations
(KFA: 3.1 System Concept Definition)

Process Area Summary

The purpose of Understand Customer Needs and Expectations is to elicit, stimulate, analyze, and communicate customer needs and expectations to obtain a better understanding of what will satisfy the customer. Understand Customer Needs and Expectations involves engaging the customer or surrogate in ongoing dialogue designed to translate his/her needs and expectations into a verifiable set of requirements which the customer understands and which provide the basis for agreements between the customer and the systems engineering effort.

Customer needs typically change over time. Organizations need to have a workable way to incorporate such changes into current and future version of the product.

1. Process Maturity

a. In your opinion, how consistently is this process area performed on your projects?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] This process area is consistently performed
(if Never performed, go to the next process area)

b. How consistently do you perform the following base practices on your projects?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Consistency	
1.	[ ]	Elicit the customer's needs, expectations, & measures of effectiveness.
2.	[ ]	Analyze the customer's needs and expectations to develop a preliminary operational concept of the system.
3.	[ ]	Develop a statement of system requirements.
4.	[ ]	Obtain the customers' agreement that system requirements satisfy their needs and expectations.
5.	[ ]	Inform the customer on a regular basis about the status and disposition of needs, expectations, and measures of effectiveness.

2. Process Adequacy

a. Does your project generally Understand the Customer Needs and Expectations to a sufficient level to ensure a cost effective system which satisfies your customers requirements?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Understand Customer Needs and Expectations sufficiently performed

b. To what extent do the following factors limit the effectiveness of the process?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Impact	
1.	[ ]	Budget limitations
2.	[ ]	Schedules limitations
3.	[ ]	Policies/procedures
4.	[ ]	Methodologies/practices
5.	[ ]	Tool availability
6.	[ ]	Tool adequacy
7.	[ ]	Systems engineering personnel availability
8.	[ ]	Engineering personnel availability
9.	[ ]	Training and personnel experience
10.	[ ]	Other _____

continued on next page

PA 06: Understand Customer Needs and Expectations, Continued

3. Applied Methodology

a. What methods do you generally use to Understand Customer Needs and Expectations? (Please describe, if required, please use additional paper and attach to the end of this questionnaire)

b. What tools do you generally use to Understand Customer Needs and Expectations?

c. What internal, industry and government standards do you follow?

d. What metrics does your organization generally apply to monitor this process?

e. Do you think metrics need to be developed for this process? [Check one]

[ ] Yes - Formal metrics to assess an organization's performance for both internal use and as source selection criteria

[ ] Yes - Informal metrics to assess an organization's performance for internal use only

[ ] No

[ ] Don't know

4. Process Improvement

What do you feel are the top two items which would improve the Understand Customer Needs and Expectations practice in your organization?

end of PA 06: Understand Customer Needs and Expectations

PA 07: Verify and Validate System
(KFA: 3.6 System Verification)
(KFA: 3.7 System Validation)

Process Area Summary

The purpose of Verify and Validate System is to ensure that the developer/supplier team performs increasingly comprehensive evaluations to ensure that evolving work products will meet all requirements. The activities associated with Verify and Validate System begin early in the development, address all work products (including requirements and design), and continue through development and integration of system elements into production, use, and disposal of the system. The scope of verification covers development of the full system, as well as its production, operation, and support. Validation is a measure of customer satisfaction, given the customer's operational need. Validation should continue throughout product use.

1. Process Maturity

a. In your opinion, how consistently is this process area performed on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] This process area is consistently performed
(if Never performed, go to the next process area)

b. How consistently do you perform the following base practices on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

Consistency	
1. [ ]	Establish plans for verification and validation that identify the overall requirements, objectives, resources, facilities, special equipment, and schedule applicable to the system development.
2. [ ]	Define the methods, process, reviews, inspections, and tests by which incremental products that were verified against established criteria or requirements that were established in a previous phase.
3. [ ]	Define the methods, process, and evaluation criteria by which the system or product is verified against the system or product requirements.
4. [ ]	Define the methods, process, and evaluation criteria by which the system or product will be validated against the customer's needs and expectations.
5. [ ]	Perform the verification and validation activities that are specified by the verification and validation plans and procedures, and capture the results.
6. [ ]	Compare the collected test, inspection, or review results with established evaluation criteria to assess the degree of success.

continued on next page

PA 07: Verify and Validate System, Continued

2. Process Adequacy

a. Does your project generally Verify and Validate Systems to a sufficient level to ensure a cost effective system which satisfies your customers requirements? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Verify and Validate System sufficiently performed

b. To what extent do the following factors limit the effectiveness of the process? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Impact	
1.	[ ]	Budget limitations
2.	[ ]	Schedules limitations
3.	[ ]	Policies/procedures
4.	[ ]	Methodologies/practices
5.	[ ]	Tool availability
6.	[ ]	Tool adequacy
7.	[ ]	Systems engineering personnel availability
8.	[ ]	Engineering personnel availability
9.	[ ]	Training and personnel experience
10.	[ ]	Other _____

3. Applied Methodology

a. What methods do you generally use to Verify and Validate System? (Please describe and if required, please use additional paper and attach to the end of this questionnaire)

b. What tools do you generally use to Verify and Validate System?

continued on next page

PA 07: Verify and Validate System, Continued

c. What internal, industry and government standards do you follow?

d. What metrics does your organization generally apply to monitor this process?

e. Do you think metrics need to be developed for this process? [Check one]

[ ] Yes - Formal metrics to assess an organization's performance for both internal use and as source selection criteria

[ ] Yes - Informal metrics to assess an organization's performance for internal use only

[ ] No

[ ] Don't know

4. Process Improvement

What do you feel are the top two items which would improve the Verify and Validate System practice in your organization?

end of PA 07: Verify and Validate System

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PA 08: Ensure Quality
(KFA: 1.6 Quality Assurance)

Process Area Summary

The purpose of Ensure Quality is to address not only the quality of the system, but also the quality of the process being used to create the system and the degree to which the project follows the defined process. The underlying concept of this process area is that high-quality systems can only be consistently produced on a continuous basis if a process exists to continuously measure and improve quality. In addition, this process must be adhered to rigorously and throughout the system life cycle. Key aspects of the process required to develop high-quality systems are measurement, analysis, and corrective action.

1. Process Maturity

a. In your opinion, how consistently is this process area performed on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] This process area is consistently performed
(if Never performed, go to the next process area)

b. How consistently do you perform the following base practices on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

Consistency		
1.	[ ]	Ensure the defined system engineering process is adhered to during the system life cycle.
2.	[ ]	Evaluate work product measures against the requirements for work product quality.
3.	[ ]	Measure the quality of the systems engineering process used by the project.
4.	[ ]	Analyze quality measurements to develop recommendations for quality improvement or corrective action as appropriate.
5.	[ ]	Obtain employee participation in identifying and reporting quality issues.
6.		Initiate activities that address identified quality issues or quality improvement opportunities.
7.	[ ]	Establish a mechanism or a set of mechanisms to detect the need for corrective actions to processes or products.

continued on next page

PA 08: Ensure Quality, Continued

2. Process Adequacy

a. Does your project generally Ensures Quality to a sufficient level to ensure a cost effective system which satisfies your customers requirements?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Ensure Quality sufficiently performed

b. To what extent do the following factors limit the effectiveness of the process?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Impact	
1.	[ ]	Budget limitations
2.	[ ]	Schedules limitations
3.	[ ]	Policies/procedures
4.	[ ]	Methodologies/practices
5.	[ ]	Tool availability
6.	[ ]	Tool adequacy
7.	[ ]	Systems engineering personnel availability
8.	[ ]	Engineering personnel availability
9.	[ ]	Training and personnel experience
10.	[ ]	Other _____

3. Applied Methodology

a. What methods do you generally use to Ensure Quality?
(Please describe and if required, please use additional paper and attach to the end of this questionnaire)

b. What tools do you generally use to Ensure Quality?

continued on next page

PA 08: Ensure Quality, Continued

c. What internal, industry and government standards do you follow?

d. What metrics does your organization generally apply to monitor this process?

e. Do you think metrics need to be developed for this process? [Check one]

[ ] Yes - Formal metrics to assess an organization's performance for both internal use and as source selection criteria

[ ] Yes - Informal metrics to assess an organization's performance for internal use only

[ ] No

[ ] Don't know

4. Process Improvement

What do you feel are the top two items which would improve the Ensure Quality practice in your organization?

end of PA 08: Ensure Quality

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PA 09: Manage Configurations
(KFA: 1.5 Configuration Management)

Process Area Summary

The purpose of Manage Configurations is to maintain data on and status of identified configuration units, and to analyze and control changes to the system and its configuration units. Managing the system configuration involves providing accurate and current configuration data and status to developers and customers.

This process area is applicable to all work products that are placed under configuration management. An example set of work products that may be placed under configuration management could include hardware and software configuration items, design rationale, requirements, product data files, or trade studies.

1. Process Maturity

a. In your opinion, how consistently is this process area performed on your projects?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] This process area is consistently performed
(if Never performed, go to the next process area)

b. How consistently do you perform the following base practices on your projects?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

Consistency	
1. [ ]	Decide among candidate methods for configuration management.
2. [ ]	Identify configuration units that constitute identified baselines.
3. [ ]	Maintain a repository of work product baselines.
4. [ ]	Control changes to established configuration units.
5. [ ]	Communicate status of configuration data, proposed changes, and access information to affected groups.

2. Process Adequacy

a. Does your project generally Manage the Configuration to a sufficient level to ensure a cost effective system which satisfies your customers requirements?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Manage Configurations sufficiently performed

b. To what extent do the following factors limit the effectiveness of the process?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

Impact	
1. [ ]	Budget limitations
2. [ ]	Schedules limitations
3. [ ]	Policies/procedures
4. [ ]	Methodologies/practices
5. [ ]	Tool availability
6. [ ]	Tool adequacy
7. [ ]	Systems engineering personnel availability
8. [ ]	Engineering personnel availability
9. [ ]	Training and personnel experience
10. [ ]	Other _____

continued on next page

PA 09: Manage Configurations, Continued

3. Applied Methodology

a. What methods do you generally use to Manage Configurations? (Please describe and if required, please use additional paper and attach to the end of this questionnaire)

b. What tools do you generally use to Manage Configurations?

c. What internal, industry and government standards do you follow?

d. What metrics does your organization generally apply to monitor this process?

e. Do you think metrics need to be developed for this process? [Check one]

[ ] Yes - Formal metrics to assess an organization's performance for both internal use and as source selection criteria

[ ] Yes - Informal metrics to assess an organization's performance for internal use only

[ ] No

[ ] Don't know

4. Process Improvement

What do you feel are the top two items which would improve the Manage Configurations practice in your organization?

end of PA 09: Manage Configurations

PA 10: Manage Risk
(KFA: 1.7 Risk Management)

Process Area Summary

The purpose of Manage Risk is to identify, assess, monitor, and mitigate risks to the success of both the systems engineering activities and the overall technical effort. This process area continues throughout the life of the project. Similar to the Plan Technical Effort (PA 12) and Monitor and Control Technical Effort (PA 11) process areas, the scope of this process area includes both the systems engineering activities and the overall technical project effort, as the systems engineering effort on the project cannot be considered successful unless the overall technical effort is successful.

1. Process Maturity

a. In your opinion, how consistently is this process area performed on your projects?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] This process area is consistently performed
(if Never performed, go to the next process area)

b. How consistently do you perform the following base practices on your projects?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Consistency	
1.	[ ]	Develop a plan for risk-management activities that is the basis for identifying, assessing, mitigating, and monitoring risks for the life of the project.
2.	[ ]	Identify project risks by examining project objectives with respect to the alternatives and constraints, and identifying what can go wrong.
3.	[ ]	Assess risks and determine the probability of occurrence and consequence of realization.
4.	[ ]	Obtain formal recognition of the project risk assessment.
5.	[ ]	Implement the risk-mitigation activities.
6.	[ ]	Monitor risk-mitigation activities to ensure that the desired results are being obtained.

2. Process Adequacy

a. Does your project generally Manages Risk to a sufficient level to ensure a cost effective system which satisfies your customers requirements?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Manage Risk sufficiently performed

b. To what extent do the following factors limit the effectiveness of the process?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Impact	
1.	[ ]	Budget limitations
2.	[ ]	Schedules limitations
3.	[ ]	Policies/procedures
4.	[ ]	Methodologies/practices
5.	[ ]	Tool availability
6.	[ ]	Tool adequacy
7.	[ ]	Systems engineering personnel availability
8.	[ ]	Engineering personnel availability
9.	[ ]	Training and personnel experience
10.	[ ]	Other _____

continued on next page

PA 10: Manage Risk, Continued

3. Applied Methodology

a. What methods do you generally use to Manage Risk?
(Please describe and if required, please use additional paper and attach to the end of this questionnaire)

b. What tools do you generally use to Manage Risk?

c. What internal, industry and government standards do you follow?

d. What metrics does your organization generally apply to monitor this process?

e. Do you think metrics need to be developed for this process? [Check one]

[ ] Yes - Formal metrics to assess an organization's performance for both internal use and as source selection criteria

[ ] Yes - Informal metrics to assess an organization's performance for internal use only

[ ] No

[ ] Don't know

4. Process Improvement

What do you feel are the top two items which would improve the Manage Risk practice in your organization?

end of PA 10: Manage Risk

PA 11: Monitor and Control Technical Effort
(KFA: 1.2 Tracking and Oversight)

Process Area Summary

The purpose of Monitor and Control Technical Effort is to provide adequate visibility of actual progress and risks. Visibility encourages timely corrective action when performance deviates significantly from plans.

Monitor and Control Technical Effort involves directing, tracking and reviewing the project's accomplishments, results, and risks against its documented estimates, commitments, and plans. A documented plan is used as the basis for tracking the activities and risks, communicating status, and revising plans.

1. Process Maturity

a. In your opinion, how consistently is this process area performed on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] This process area is consistently performed
(if Never performed, go to the next process area)

b. How consistently do you perform the following base practices on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

Consistency	
1. [ ]	Direct technical effort in accordance with technical management plans.
2. [ ]	Track actual use of resources against technical management plans.
3. [ ]	Track performance against the established technical parameters.
4. [ ]	Review performance against the technical management plans.
5. [ ]	Analyze issues resulting from the tracking and review of technical parameters to determine corrective actions.
6. [ ]	Take corrective actions when actual results deviate from plans.

2. Process Adequacy

a. Does your project generally Monitor and Control the Technical Effort to a sufficient level to ensure a cost effective system which satisfies your customers requirements? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Monitor and Control Technical Effort sufficiently performed

b. To what extent do the following factors limit the effectiveness of the process? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

Impact	
1. [ ]	Budget limitations
2. [ ]	Schedules limitations
3. [ ]	Policies/procedures
4. [ ]	Methodologies/practices
5. [ ]	Tool availability
6. [ ]	Tool adequacy
7. [ ]	Systems engineering personnel availability
8. [ ]	Engineering personnel availability
9. [ ]	Training and personnel experience
10. [ ]	Other _____

continued on next page

PA 11: Monitor and Control Technical Effort, Continued

3. Applied Methodology

a. What methods do you generally use to Monitor and Control Technical Effort? (Please describe and if required, please use additional paper and attach to the end of this questionnaire)

b. What tools do you generally use to Monitor and Control Technical Effort?

c. What internal, industry and government standards do you follow?

d. What metrics does your organization generally apply to monitor this process?

e. Do you think metrics need to be developed for this process? [Check one]

[ ] Yes - Formal metrics to assess an organization's performance for both internal use and as source selection criteria

[ ] Yes - Informal metrics to assess an organization's performance for internal use only

[ ] No

[ ] Don't know

4. Process Improvement

What do you feel are the top two items which would improve the Monitor and Control Technical Effort practice in your organization?

end of PA 11: Monitor and Control Technical Effort

PA 12: Plan Technical Effort
(KFA: 1.1 Planning)

Process Area Summary

The purpose of Plan Technical Effort is to establish plans that provide the basis for scheduling, costing, controlling, tracking, and negotiating the nature and scope of the technical work involved in system development, manufacturing, use, and disposal. System engineering activities must be integrated into comprehensive technical planning for the entire project.

Plan technical effort involves developing estimates for the work to be performed, obtaining necessary commitments from interfacing groups, and defining the plan to perform the work.

1. Process Maturity

a. In your opinion, how consistently is this process area performed on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] This process area is consistently performed
(if Never performed, go to the next process area)

b. How consistently do you perform the following base practices on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Consistency	
1.	[ ]	Identify resources that are critical to the technical success of the project.
2.	[ ]	Develop estimates for the factors that affect the magnitude and technical feasibility of the project.
3.	[ ]	Develop cost estimates for all technical resources required by the project.
4.	[ ]	Determine the technical process to be used on the project.
5.	[ ]	Identify technical activities for the entire life cycle of the project.
6.	[ ]	Define specific processes to support effective interaction with the customer(s) and supplier(s).
7.	[ ]	Develop technical schedules for the entire project life cycle.
8.	[ ]	Establish technical parameters with thresholds for the project and the system.
9.	[ ]	Use the information gathered in planning activities to develop technical management plans that will serve as the basis for tracking the salient aspects of the project and the systems engineering effort.
10.	[ ]	Review the technical management plans with all affected groups and individuals, and obtain group commitment.

continued on next page

PA 12: Plan Technical Effort, Continued

2. Process Adequacy

a. Does your project generally Plan the Technical Effort to a sufficient level to ensure a cost effective system which satisfies your customers requirements?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Plan Technical Effort sufficiently performed

b. To what extent do the following factors limit the effectiveness of the process?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Impact	
1.	[ ]	Budget limitations
2.	[ ]	Schedules limitations
3.	[ ]	Policies/procedures
4.	[ ]	Methodologies/practices
5.	[ ]	Tool availability
6.	[ ]	Tool adequacy
7.	[ ]	Systems engineering personnel availability
8.	[ ]	Engineering personnel availability
9.	[ ]	Training and personnel experience
10.	[ ]	Other _____

3. Applied Methodology

a. What methods do you generally use to Plan Technical Effort?
(Please describe and if required, please use additional paper and attach to the end of this questionnaire)

b. What tools do you generally use to Plan Technical Effort?

continued on next page

PA 12: Plan Technical Effort, Continued

c. What internal, industry and government standards do you follow?

d. What metrics does your organization generally apply to monitor this process?

e. Do you think metrics need to be developed for this process? [Check one]

[ ] Yes - Formal metrics to assess an organization's performance for both internal use and as source selection criteria

[ ] Yes - Informal metrics to assess an organization's performance for internal use only

[ ] No

[ ] Don't know

4. Process Improvement

What do you feel are the top two items which would improve the Plan Technical Effort practice in your organization?

end of PA 12: Plan Technical Effort

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PA 13: Define Organization's Systems Engineering Process
(KFA: 2.1 Process Management and Improvement)

Process Area Summary

The purpose of Define Organization's Systems Engineering Process is to create and manage the organization's standard systems engineering processes, which can subsequently be tailored by a project to form the unique processes that it will follow in developing its systems or products.

Define Organization's Systems Engineering Process involves defining, collecting, and maintaining the process that will meet the business goals of the organization, as well as designing, developing, and documenting systems-engineering process assets. Assets include example processes, process fragments, process-related documentation, process architectures, process-tailoring rules and tools, and process measurements.

1. Process Maturity

a. In your opinion, how consistently is this process area performed on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] This process area is consistently performed
(if Never performed, go to the next process area)

b. How consistently do you perform the following base practices on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

Consistency	
1. [ ]	Establish goals for the organization's systems engineering process from the organization's business goals.
2. [ ]	Collect and maintain systems-engineering process assets.
3. [ ]	Develop a well-defined standard systems engineering process for the organization.
4. [ ]	Define guidelines for tailoring the organization's standard systems engineering process for project use in developing the project's defined process.

continued on next page

PA 13: Define Organization's Systems Engineering Process, Continued

2. Process Adequacy

a. Does your organization/project generally Define the Organization's Systems Engineering Process to a sufficient level to ensure a cost effective system which satisfies your customers requirements?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Define Organization's Systems Engineering Process sufficiently performed

b. To what extent do the following factors limit the effectiveness of the process?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Impact	
1.	[ ]	Budget limitations
2.	[ ]	Schedules limitations
3.	[ ]	Policies/procedures
4.	[ ]	Methodologies/practices
5.	[ ]	Tool availability
6.	[ ]	Tool adequacy
7.	[ ]	Systems engineering personnel availability
8.	[ ]	Engineering personnel availability
9.	[ ]	Training and personnel experience
10:	[ ]	Other _____

3. Applied Methodology

a. What methods do you generally use to Define Organization's Systems Engineering Process?
(Please describe, if required, please use additional paper and attach to the end of this questionnaire)

b. What tools do you generally use to Define Organization's Systems Engineering Process?

continued on next page

PA 13: Define Organization's Systems Engineering Process, Continued

c. What internal, industry and government standards do you follow?

d. What metrics does your organization generally apply to monitor this process?

e. Do you think metrics need to be developed for this process? [Check one]

[ ] Yes - Formal metrics to assess an organization's performance for both internal use and as source selection criteria

[ ] Yes - Informal metrics to assess an organization's performance for internal use only

[ ] No

[ ] Don't know

4. Process Improvement

What do you feel are the top two items which would improve the Define Organization's Systems Engineering Process practice in your organization?

end of PA 13: Define Organization's Systems Engineering Process

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PA 14: Improve Organization's Systems Engineering Processes
(KFA: 2.1 Process Management and Improvement)

Process Area Summary

The purpose of Improve Organization's Systems Engineering Processes is to gain competitive advantage by continuously improving the effectiveness and efficiency of the systems engineering processes used by the organization. It involves developing an understanding of the organization's processes in the context of the organization's business goals, analyzing the performance of the processes, and explicitly planning and deploying improvements to those processes.

1. Process Maturity

a. In your opinion, how consistently is this process area performed on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] This process area is consistently performed
(if Never performed, go to the next process area)

b. How consistently do you perform the following base practices on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Consistency	
1.	[ ]	Appraise the existing processes being performed in the organization to understand their strengths and weaknesses.
2.	[ ]	Plan improvements to the organization's processes based on analyzing the impact of potential improvements on achieving the goals of the processes.
3.	[ ]	Change the organization's standard systems engineering process to reflect targeted improvements.
4.	[ ]	Communicate process improvements to existing projects and to other affected groups, as appropriate.

2. Process Adequacy

a. Does your project/organization generally Improve the Organization's Systems Engineering Processes to a sufficient level to ensure a cost effective system which satisfies your customers requirements? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Improve Organization's Systems Engineering Processes sufficiently performed

b. To what extent do the following factors limit the effectiveness of the process? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Impact	
1.	[ ]	Budget limitations
2.	[ ]	Schedules limitations
3.	[ ]	Policies/procedures
4.	[ ]	Methodologies/practices
5.	[ ]	Tool availability
6.	[ ]	Tool adequacy
7.	[ ]	Systems engineering personnel availability
8.	[ ]	Engineering personnel availability
9.	[ ]	Training and personnel experience
10:	[ ]	Other _____

continued on next page

PA 14: Improve Organization's Systems Engineering Process, Continued

3. Applied Methodology

a. What methods do you generally use to Improve Organization's Systems Engineering Processes?
(Please describe and if required, please use additional paper and attach to the end of this questionnaire)

b. What tools do you generally use to Improve Organization's Systems Engineering Processes?

c. What internal, industry and government standards do you follow?

continued on next page

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PA 15: Manage Product Line Evolution
(KFA: 2.3 Technology Management)

Process Area Summary

The purpose of Manage Product Line Evolution is to introduce services, equipment, and new technology to achieve the optimal benefits in product evolution, cost, schedule, and performance over time as the product line evolves toward its ultimate objectives.

An organization must first determine the evolution of a product. Then the organization has to decide how it will design and build those products including critical components, cost-effective tools, and efficient and effective processes.

1. Process Maturity

a. In your opinion, how consistently is this process area performed on your projects?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] This process area is consistently performed
(if Never performed, go to the next process area)

b. How consistently do you perform the following base practices on your projects?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

Consistency	
1. [ ]	Define the types of products to be offered.
2. [ ]	Identify new product technologies or enabling infrastructure that will help the organization acquire, develop, and apply technology for competitive advantage.
3. [ ]	Make the necessary changes in the product development cycle to support the development of new products.
4. [ ]	Ensure critical components are available to support planned product evolution.
5. [ ]	Insert new technology into product development, marketing, and manufacturing.

2. Process Adequacy

a. Does your project/organization generally Manage the Product Line Evolution to a sufficient level to ensure a cost effective system which satisfies your customers requirements?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Manage Product Line Evolution sufficiently performed

b. To what extent do the following factors limit the effectiveness of the process?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

Impact	
1. [ ]	Budget limitations
2. [ ]	Schedules limitations
3. [ ]	Policies/procedures
4. [ ]	Methodologies/practices
5. [ ]	Tool availability
6. [ ]	Tool adequacy
7. [ ]	Systems engineering personnel availability
8. [ ]	Engineering personnel availability
9. [ ]	Training and personnel experience
10: [ ]	Other _____

continued on next page

PA 15: Manage Product Line Evolution, Continued

3. Applied Methodology

a. What methods do you generally use to Manage Product Line Evolution? (Please describe and if required, please use additional paper and attach to the end of this questionnaire)

b. What tools do you generally use to Manage Product Line Evolution?

c. What internal, industry and government standards do you follow?

d. What metrics does your organization generally apply to monitor this process?

e. Do you think metrics need to be developed for this process? [Check one]

[ ] Yes - Formal metrics to assess an organization's performance for both internal use and as source selection criteria

[ ] Yes - Informal metrics to assess an organization's performance for internal use only

[ ] No

[ ] Don't know

4. Process Improvement

What do you feel are the top two items which would improve the Manage Product Line Evolution practice in your organization?

end of PA 15: Manage Product Line Evolution

PA 16: Manage Systems Engineering Support Environment
(KFA: 2.4 Environment and Tool Support)

Process Area Summary

The purpose of Manage Systems Engineering Support Environment is to provide the technology environment needed to develop the product and perform the process. Development and process technology is inserted into the environment with a goal of minimizing disruption of development activities while upgrading to make new technology available.

The technology needs of an organization change over time, and the efforts described in this process area must be re-executed as the needs evolve.

1. Process Maturity

a. In your opinion, how consistently is this process area performed on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] This process area is consistently performed
(if Never performed, go to the next process area)

b. How consistently do you perform the following base practices on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

Consistency	
1. [ ]	Maintain awareness of the technologies that support the organization's goals.
2. [ ]	Determine requirements for the organization's systems engineering support environment based on organizational needs.
3. [ ]	Obtain a systems engineering support environment that meets the requirements established in Determine Support Requirements by using the practices in the Analyze Candidate Solutions process area.
4. [ ]	Tailor the systems engineering support environment to individual project's needs.
5. [ ]	Insert new technologies into the systems engineering support environment based on the organization's business goals and the projects' needs.
6. [ ]	Maintain the systems engineering support environment to continuously support the projects dependent on it.
7. [ ]	Monitor the systems engineering support environment for improvement opportunities.

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PA 16: Manage Systems Engineering Support Environment, Continued

2. Process Adequacy

a. Does your project/organization generally Manage the Systems Engineering Support Environment to a sufficient level to ensure a cost effective system which satisfies your customers requirements?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Manage Systems Engineering Support Environment sufficiently performed

b. To what extent do the following factors limit the effectiveness of the process?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Impact	
1.	[ ]	Budget limitations
2.	[ ]	Schedules limitations
3.	[ ]	Policies/procedures
4.	[ ]	Methodologies/practices
5.	[ ]	Tool availability
6.	[ ]	Tool adequacy
7.	[ ]	Systems engineering personnel availability
8.	[ ]	Engineering personnel availability
9.	[ ]	Training and personnel experience
10:	[ ]	Other _____

3. Applied Methodology

a. What methods do you generally use to Manage Systems Engineering Support Environment?
(Please describe, if required, please use additional paper and attach to the end of this questionnaire)

b. What tools do you generally use to Manage Systems Engineering Support Environment?

continued on next page

PA 16: Manage Systems Engineering Support Environment, Continued

c. What internal, industry and government standards do you follow?

d. What metrics does your organization generally apply to monitor this process?

e. Do you think metrics need to be developed for this process? [Check one]

[ ] Yes - Formal metrics to assess an organization's performance for both internal use and as source selection criteria

[ ] Yes - Informal metrics to assess an organization's performance for internal use only

[ ] No

[ ] Don't know

4. Process Improvement

What do you feel are the top two items which would improve the Manage Systems Engineering Support Environment practice in your organization?

end of PA 16: Manage Systems Engineering Support Environment

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PA 17: Provide Ongoing Skills and Knowledge
(KFA: 2.2 Training)

Process Area Summary

The purpose of Provide Ongoing Skills and Knowledge is to ensure that projects and the organization have the necessary knowledge and skills to achieve project and organizational objectives. To ensure the effective application of these critical resources that are predominantly available only from people, the knowledge and skill requirements within the organization need to be identified, as well as the specific project's or organization's needs (such as those relating to emergent programs or technology, and new products, processes, and policies).

Needed skills and knowledge can be provided both by training within the organization and by timely acquisition from sources external to the organization. Acquisition from external sources may include customer resources, temporary hires, new hires, consultants, and subcontractors. In addition, knowledge may be acquired from subject matter experts.

1. Process Maturity

a. In your opinion, how consistently is this process area performed on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] This process area is consistently performed
(if Never performed, go to the next process area)

b. How consistently do you perform the following base practices on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

Consistency	
1. [ ]	Identify needed improvements in skill and knowledge throughout the organization using the projects' needs, organizational strategic plan, and existing employee skills as guidance.
2. [ ]	Evaluate and select the appropriate mode of acquiring knowledge or skills with respect to training or other sources.
3. [ ]	Ensure that appropriate skill and knowledge are available to the systems engineering effort.
4. [ ]	Prepare training materials based upon the identified training needs.
5. [ ]	Train personnel to have the skills and knowledge needed to perform their assigned roles.
6. [ ]	Assess the effectiveness of the training to meet the identified training needs.
7. [ ]	Maintain records of training and experience.
8. [ ]	Maintain training materials in an accessible repository.

continued on next page

PA 17: Provide Ongoing Skills and Knowledge, Continued

2. Process Adequacy

a. Does your project/organization generally Provide the Ongoing Skills and Knowledge to a sufficient level to ensure a cost effective system which satisfies your customers requirements?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Provide Ongoing Skills and Knowledge sufficiently performed

b. To what extent do the following factors limit the effectiveness of the process?
(N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Impact	
1.	[ ]	Budget limitations
2.	[ ]	Schedules limitations
3.	[ ]	Policies/procedures
4.	[ ]	Methodologies/practices
5.	[ ]	Tool availability
6.	[ ]	Tool adequacy
7.	[ ]	Systems engineering personnel availability
8.	[ ]	Engineering personnel availability
9.	[ ]	Training and personnel experience
10:	[ ]	Other _____

3. Applied Methodology

a. What methods do you generally use to Provide Ongoing Skills and Knowledge? (Please describe and if required, please use additional paper and attach to the end of this questionnaire)

b. What tools do you generally use to Provide Ongoing Skills and Knowledge?

continued on next page

PA 17: Provide Ongoing Skills and Knowledge, Continued

c. What internal, industry and government standards do you follow?

d. What metrics does your organization generally apply to monitor this process?

e. Do you think metrics need to be developed for this process? [Check one]

[ ] Yes - Formal metrics to assess an organization's performance for both internal use and as source selection criteria

[ ] Yes - Informal metrics to assess an organization's performance for internal use only

[ ] No

[ ] Don't know

4. Process Improvement What do you feel are the top two items which would improve the Provide Ongoing Skills and Knowledge practice in your organization?

end of PA 17: Provide Ongoing Skills and Knowledge

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PA 18: Coordinate With Suppliers
(KFA: 1.3 Subcontract Management)

Process Area Summary

The purpose of Coordinate With Suppliers is to address the needs of organizations to effectively manage the portions of product work that are conducted by other organizations. Decisions made as a part of this process area should be made in accordance with the Analyze Candidate Solutions process area (PA 01). The general term *supplier* is used to identify an organization that develops, manufactures, tests, supports, etc., a component of the system. Suppliers may take the form of vendors, subcontractors, partnerships, etc., as the business organization warrants.

In addition to coordination of schedules, processes, and deliveries of work products, affected organizations must have a shared a vision of the working relationship. Relationships can range from integrated developer/supplier product teams, to prime-contractor/subcontractor, to vendors, and more. A successful relationship between an organization and a supplier depends on the capability of both organizations, and on a mutual understanding of the relationship and expectations.

1. Process Maturity

a. In your opinion, how consistently is this process area performed on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] This process area is consistently performed
(if Never performed, go to the next process area)

b. How consistently do you perform the following base practices on your projects? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Consistency	
1.	[ ]	Identify needed system components or services that must be provided by other/outside organizations.
2.	[ ]	Identify suppliers that have shown expertise in the identified areas.
3.	[ ]	Choose suppliers in accordance with the Analyze Candidate Solutions process area (PA 01).
4.	[ ]	Provide to suppliers the needs, expectations, and measures of effectiveness held by the organization for the system components or services that are to be delivered.
5.	[ ]	Maintain timely two-way communication with suppliers.

continued on next page

PA 18: Coordinate With Suppliers, Continued

2. Process Adequacy

a. Does your project/organization generally Coordinate With Suppliers to a sufficient level to ensure a cost effective system which satisfies your customers requirements? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

[ ] Coordinate with Suppliers sufficiently performed

b. To what extent do the following factors limit the effectiveness of the process? (N=Never, S=Seldom, U=Usually, O=Often, A=Always, D=Don't know)

	Impact	
1.	[ ]	Budget limitations
2.	[ ]	Schedules limitations
3.	[ ]	Policies/procedures
4.	[ ]	Methodologies/practices
5.	[ ]	Tool availability
6.	[ ]	Tool adequacy
7.	[ ]	Systems engineering personnel availability
8.	[ ]	Engineering personnel availability
9.	[ ]	Training and personnel experience
10:	[ ]	Other _____

3. Applied Methodology

a. What methods do you generally use to Coordinate With Suppliers? (Please describe and if required, please use additional paper and attach to the end of this questionnaire)

b. What tools do you generally use to Coordinate With Suppliers?

continued on next page

PA 18: Coordinate With Suppliers, Continued

c. What internal, industry and government standards do you follow?

d. What metrics does your organization generally apply to monitor this process?

e. Do you think metrics need to be developed for this process? [Check one]

[ ] Yes - Formal metrics to assess an organization's performance for both internal use and as source selection criteria

[ ] Yes - Informal metrics to assess an organization's performance for internal use only

[ ] No

[ ] Don't know

4. Process Improvement

What do you feel are the top two items which would improve the Coordinate With Suppliers practice in your organization?

end of PA 18: Coordinate With Suppliers

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5. Survey Feedback

Respondent Information

Name: _____ Date: _____

Title: _____

Phone: _____

Fax: _____

Project: _____

Organizational Information

Organization: _____

Address: _____

_____

_____

_____

_____

_____

a. Who are your organization's customers? [Check all that apply]

[ ] Department of Defense
[ ] Civilian Federal Government
[ ] State Government
[ ] Local Government
[ ] Commercial
[ ] Industrial

b. How much time did you spend filling out this questionnaire?

[ ] 30 Min.	[ ] 2 Hours
[ ] 60 Min.	[ ] 2.5 Hours
[ ] 90 Min.	[ ] (Other)_____

c. Which Process Areas did you fill out?

[ ] All

[ ] 1	[ ] 7	[ ] 13
[ ] 2	[ ] 8	[ ] 14
[ ] 3	[ ] 9	[ ] 15
[ ] 4	[ ] 10	[ ] 16
[ ] 5	[ ] 11	[ ] 17
[ ] 6	[ ] 12	[ ] 18

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d. Where the Process Areas understandable
[ ] Yes [ ] No

e. If not, which ones and why?

f. Where the instructions clear?
[ ] Yes [ ] No

g. If not, why?

h. Was the format easy to use?
[ ] Yes [ ] No

i. If not, why?

continued on next page

j. General comments?

end of 5. Survey Feedback

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